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IS 11852-2 (2001): Automotive Vehicles - Brakes and Braking Systems, Part 2: General Functions and Features [TED 4: Automotive Braking Systems]

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स्वचल वाहन — ब्रेक और ब्रेकिंग तंत्र

भाग 2 सामान्य कार्य और विशेषताएं

(पहला पुनरीक्षण)

Indian Standard

AUTOMOTIVE VEHICLES — BRAKES AND BRAKING SYSTEMS

PART 2 GENERAL FUNCTIONS AND FEATURES

(First Revision)

ICS 43.040.40

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

April 2001 **Price Group 5**

Automotive Braking Systems Sectional Committee, TED 4

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Braking Systems Sectional Committee had been approved by the Transport Engineering Division Council.

This standard on brakes and braking systems which was earlier issued in eight parts, has now been revised and issued in nine parts which are as under:

Part 1 Terminology;
Part 2 General functions and features;
Part 3 Performance requirements and evaluation;
Part 4 Compressed air and air assisted brakes — Special requirements;
Part 5 Compressed air and air assisted brakes — Pressure test connections;
Part 6 Vacuum braking systems — Special requirements;
Part 7 Inertia dynamometer test method for brake linings;
Part 8 Test procedures; and
Part 9 Requirements for vehicles equipped with anti-lock braking devices.

IS 11852 (Part 7) : 1995 'Automotive vehicles — Recommendations for brakes and braking systems: Part 7 model test report' has been withdrawn in this revision and has been replaced with a part covering 'Inertia dynamometer test methods for brake linings'. Part 9 covering the requirements for vehicles equipped with anti-lock braking devices has been added.

This standard is mainly based on EEC directives 71/320, 74/132, 75/524, 79/489, 85/647, 88/194 and 91/422 EEC relating to the braking devices of certain categories of motor vehicles and of their trailers.

However apart from the changes made from EEC directives to suit the Indian conditions, the nomenclature of some of the tests and categories of vehicles have also been changed which are as under:

EEC Directives	*Indian Standards*
Category 'O' Vehicle	Category 'T' Vehicle
Type 'O' test	Type 'P' test
Type I test	Type 'F' test
Type II test	Type 'H' test

AMENDMENT NO. 1 NOVEMBER 2003
TO
IS 11852 (PART 2) : 2001 AUTOMOTIVE VEHICLES —BRAKES AND BRAKING SYSTEMS

PART 2 GENERAL FUNCTIONS AND FEATURES

*(**First Revision**)*

(*Page* 7, *clause* **4.2.2.13**) — Substitute the following for the existing clause:

'**4.2.2.13** Trailers of category T4, if fitted with anti-lock braking devices shall be in accordance with IS 11852 (Part 9).'

(TED 4)

Reprography Unit, BIS, New Delhi, India

Indian Standard

AUTOMOTIVE VEHICLES — BRAKES AND BRAKING SYSTEMS

PART 2 GENERAL FUNCTIONS AND FEATURES

(First Revision)

1 SCOPE

1.1 This standard covers the description of various categories of vehicles dealt with in other parts of this standard and gives various functions and features of the braking systems including braking system of all types of trailers.

1.2 This standard is not applicable to the following types of vehicles:

a) Agricultural tractors and power tillers,
b) Earth-moving machinery,
c) Construction equipment vehicles,
d) Vehicles moving on rails,
e) Two wheelers,
f) Three wheelers, and
g) Vehicles with design speed not exceeding 25 km/h.

2 REFERENCES

2.1 The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
8654 : 1986	Automotive hydraulic brake fluid — heavy duty (*first revision*)
9211 : 1979	Denominations and definitions of weights of road vehicles (*under revision*)
11852	Automotive vehicles — Brakes and braking systems:
(Part 1) : 2001	Terminology (*first revision*)
(Part 3) : 2001	Performance requirements and evaluation (*first revision*)
(Part 8) : 2001	Test procedure (*first revision*)
(Part 9) : 2001	Requirements for vehicles equipped with anti-lock braking devices

3 DEFINITIONS AND CATEGORY OF VEHICLES

3.1 Vehicle

For the purposes of this standard 'vehicle' means any motor vehicle and its trailer (wherever applicable) falling within one of the categories listed below and intended for use on the road, such vehicle being with or without body work, having at least four wheels and a maximum design speed exceeding 25 km/h, and its trailers (wherever applicable), with the exception of vehicles as per **1.2** above.

3.1.1 Category M — Motor vehicles used for carrying passengers and having at least four wheels.

Category M1 — Vehicles used for carrying passengers and comprising not more than eight seats in addition to the driver's seat.

Category M2 — Vehicles used for carrying passengers, comprising more than eight seats in addition to the driver's seat and having a maximum mass not exceeding 5 t.

Category M3 — Vehicles used for carrying passengers, comprising more than eight seats in addition to the driver's seat and having a maximum mass exceeding 5 t.

3.1.2 Category N — Motor vehicles used for carrying goods and having at least four wheels.

Category N1 — Vehicles used for carrying goods and having a maximum mass not exceeding 3.5 t.

Category N2 — Vehicles used for carrying goods and having a maximum mass exceeding 3.5 t but not exceeding 12 t.

Category N3 — Vehicles used for carrying goods and having a maximum mass exceeding 12 t.

3.1.3 Category T — Trailers (including semi-trailers).

Category T1 — Trailers with a maximum mass not exceeding 0.75 t.

Category T2 — Trailers with a maximum mass exceeding 0.75 t but not exceeding 3.5 t.

Category T3 — Trailers with a maximum mass exceeding 3.5 t but not exceeding 10 t.

Category T4 — Trailers with a maximum mass exceeding 10 t.

3.1.4 While classifying the vehicles into the above categories the following shall apply:

a) Articulated category M vehicles made up of two nonseparable but articulated units shall be considered to be a single vehicles.

b) In the case of a category M or N towing vehicle designed to be coupled to a semi-trailer, the maximum mass to be taken into consideration when classifying that vehicle shall be the mass of the towing vehicle in running order plus the maximum mass transferred to the towing vehicle by the semi-trailer in static condition and where appropriate, the maximum mass of the towing vehicle's own load.

c) In the case of category N vehicles, the equipment and fittings of the certain special vehicles not intended for carrying passengers (such as, crane vehicles, workshop vehicles, construction equipment vehicles, etc) shall be considered to be goods.

d) The maximum mass to be taken into consideration when classifying a category T semi-trailer shall be the mass transmitted to the ground by the axle or axles of the semi-trailer in static condition when coupled to the towing vehicle and laden with a maximum load.

3.2 Type of vehicle with respect to the braking systems—means vehicles which do not differ in such essential respects as:

3.2.1 In the case of motor vehicles:

a) vehicle category as defined in **2.1**,
b) maximum mass as defined in **2.3**,
c) distribution of mass among the axles,
d) maximum design speed,
e) different types of braking system with particular reference to the presence or otherwise of systems for braking a trailer.
f) number and arrangement of the axles,
g) engine type,
h) number and ratios of gears,
j) ratio(s) of rear drive axle(s); and
k) tyre dimensions.

3.2.2 In the case of trailers:

a) vehicle category as defined in **2.1**,
b) maximum mass as defined in **2.3**,
c) distribution of mass among the axles, .
d) different types of braking systems,
e) number and arrangement of the axles, and
f) tyre dimensions.

3.3 Laden Vehicle

Means, except where otherwise stated, a vehicle loaded to its maximum mass.

3.4 Unladen Vehicle

3.4.1 *Completely Built Vehicle*

Means the vehicle in the kerb weight condition as defined in IS 9211 to which weight not exceeding 180 kg is added.

3.4.2 *Incompletely Built Vehicle*

Incompletely built vehicles (such as, drive away chassis) unladen vehicle means unladen vehicle weight as specified by the vehicle manufacturer to represent fully built vehicle to which weight not exceeding 180 kg is added. In the absence of such a specification, the values given in table under **9.7** of IS 11852 (Part 8) shall apply.

3.5 Maximum Mass

Means, the maximum mass stated by the vehicle manufacturer to be technically permissible.

4 FUNCTIONS AND FEATURES OF BRAKING SYSTEMS

4.1 General

4.1.1 *Braking System*

The braking system, as defined in IS 11852 (Part 1), shall be so designed, constructed and fitted as to enable the vehicle in normal use, despite the vibration to which it may be subjected, to comply with the requirements specified in **4.1.2** and **4.2.** It shall also be able to resist the corrosion and aging phenomenon to which it is exposed.

4.1.2 *Functions of the Braking System*

The braking system shall fulfill the following conditions.

4.1.2.1 *Service braking system*

The service braking system shall enable the driver to decelerate and/or halt the vehicle safely, speedily and effectively, whatever may be its speed and load on any up or down gradient. It shall be possible to graduate this braking action. The driver shall be able to achieve this braking action from his driving seat without removing his hands from the steering control.

4.1.2.2 *Secondary braking system*

The secondary braking system shall make it possible to decelerate and/or halt the vehicle within a reasonable distance in the event of the failure of the service braking. It shall be possible to graduate this braking action. The driver shall be able to obtain this braking action from his driving seat while keeping at least one hand on the steering control. For the purposes of these requirements, it is assumed that not more than one failure of the service braking system can occur at one time.

4.1.2.3 *Parking braking system*

The parking braking system shall enable the vehicle to be held stationary on a level road or on an up or down gradient even in the absence of the driver, the working parts being then held in the locked position by a purely mechanical system. The driver shall be able to achieve this braking action from his driver seat, except in the case of a trailer, to the requirements of **4.2.2.10**. The trailer brake and the parking brake of the towing vehicle may be operated simultaneously, provided that the driver is able to check that the parking brake performance of the vehicle combination, obtained by the purely mechanical action of the parking system, is sufficient.

4.1.3 *Pneumatic Connections Between Motor Vehicles and Trailers*

4.1.3.1 In the case of a braking system operate by compressed air, the penumatic link with the trailer shall be of the type with two or more lines. However, in all cases, all the requirements of this standard shall be satisfied by the use of only two lines. The devices coupling the pneumatic system of the towing vehicle to the trailer shall shut off automatically when the coupling is disconnected. In the case of articulated vehicle combinations, the flexible hoses shall be a part of the towing vehicle. In all other cases, the flexible hoses shall be a part of the trailer.

4.2 Characteristics of Braking System

4.2.1 *Vehicles of Categories M and N*

4.2.1.1 The braking systems with which a vehicle is equipped shall satisfy the requirements laid down for the service, secondary and parking brakes.

4.2.1.2 The systems providing service, secondary and parking braking may have common components, provided that they fulfill the following conditions:

a) There shall be at least two controls, independent of each other and readily accessible to the driver from the driving seat. This requirement shall be met even when the driver is wearing a safety belt;

b) The control of the service braking system shall be independent of the control of the parking braking system;

c) Where the service and secondary braking system have the same control, the effectiveness of the linkage between that control and the various components of the transmission systems shall not be liable to diminish after a certain period of use;

d) Where the service and secondary braking systems have the same control, the parking braking system shall be so designed that it can be actuated by the driver even while wearing a safety belt when the vehicle is in motion with at least one hand on steering wheel. The action shall be graduated.

e) In the event of a breakage of any component other than the brakes or the components in (g) or of any other failure of the service braking system (malfunction, partial or total exhaustion of an energy reserve), the secondary braking system or that part of the service braking system which is not affected by the failure shall be able to decelerate and bring the vehicle to a halt in the conditions prescribed for secondary braking;

f) In particular, where the secondary braking system and the service braking system have a common control and common transmission:

    i) Where the service braking system is actuated by the muscular energy of the driver assisted by one or more energy reserves, the secondary braking system shall be capable of ensuring the prescribed degree of secondary braking even in the event of failure of that assistance, by muscular energy of the driver assisted by the energy reserves, if any, which are unaffected by the failure, the force applied to the control not exceeding the prescribed maximum value.

    ii) Where the force for the service braking and transmission depend exclusively on the use of an energy reserve controlled by the driver, there shall be at least two completely independent energy reserves, each provided with its own independent transmission; each of them may act on the brakes of only two or more wheels so selected as to be capable of ensuring by themselves the prescribed degree of secondary braking without endangering the stability of the vehicle during braking. In addition, each of these energy reserve shall be fitted with a warning device as defined in **4.2.1.13**.

g) Certain parts, such as the pedal and its bearing, the master cylinder and its piston(s) (hydraulic systems), the control valve (hydraulic and/or pneumatic systems), the linkage between the pedal and the master cylinder or the control valve, the brake cylinders and their pistons (hydraulic and/or pneumatic systems) and the lever and cam assemblies of brakes, shall not be regarded as liable to breakage if they are adequately dimensioned and readily accessible for maintenance, and exhibit safety features at least equal to those prescribed for other essential components, (such as the steering linkage), of the vehicle. Where the failure of any such part would make it impossible to brake the vehicle with a performance at least equal to that prescribed for the secondary braking, that part shall be made of metal or of a material with equivalent characteristics and shall not be subjected to significant distortion in the normal operation of the braking systems.

4.2.1.3 Where there are separate controls for the service and secondary braking systems, simultaneous actuation of the two controls shall not render both the service and secondary braking systems inoperative, either when both braking systems are in good working order or when one of them is faulty.

4.2.1.4 In the event of failure in a part of the transmission of the service brake, the following conditions shall be met:

a) A sufficient number of wheels shall still be braked by actuation of the service braking system/controls, whatever the vehicle load may be;

b) These wheels shall be so selected that the residual performance of the service braking system satisfies the requirements laid down in **4.1.4** of IS 11852 (Part 3).

c) However, the above requirements shall not apply to towing vehicles for semi-trailers when the transmission of the service braking system of the semi-trailer is independent of that of the towing vehicle.

4.2.1.5 Where use is made of energy other than the muscular energy of the driver, there need not be more than one source of such other energy (hydraulic pump, air compressor, vacuum pump, etc), but that means by which the device constituting that source is driven shall be as safe as practicable.

4.2.1.5.1 In the event of failure in any one part of the transmission of the vehicle's braking system, supply to the part not affected by the failure shall continue to be ensured where this is required for the purpose of halting the vehicle with the degree of effectiveness prescribed for secondary braking. This condition shall be met by means of devices which can be easily actuated when the vehicle is stationary, or by automatic means.

4.2.1 5.2 Furthermore, storage devices located down-circuit of this device shall be such that in the event of a failure in the energy supply, after four full-stroke actuations of the service brake control under the conditions laid down in **2.2** of IS 11852 (Part 4), it is still possible to halt the vehicle at the fifth application with the degree of effectiveness prescribed for secondary braking.

4.2.1.6 The requirements of **4.2.1.2**, **4.2.1.4** and **4.2.1.5** shall be met without the use of any automatic system of a kind such that its ineffectiveness might pass unnoticed because the parts which are normally in an 'at rest' position are actuated only in the event of failure of the braking system.

4.2.1.7 The service braking system shall act on all the wheels of the vehicle.

4.2.1.8 The action of the service braking system shall be appropriately distributed among the axles. In the case of vehicles with more than two axles, in order to avoid wheel-locking or glazing of the brake linings, the brake force on certain axles may be reduced to zero automatically when carrying a much reduced load, provided that the vehicle meets all the performance requirements prescribed in IS 11852 (Part 3).

4.2.1.9 The action of the service braking system shall be distributed between the wheels of the same axle symmetrically in relation to the longitudinal median plane of the vehicle. In the case of pneumatic brakes, minor variation in pressure between left and right side of brake actuator may be permitted provided directional stability of the vehicle is not affected.

4.2.1.10 The service, secondary and parking braking system shall act on braking surfaces permanently connected to the wheels through components of adequate strength. It shall not be possible to disconnect the braking surface from the wheels. However, in the case of parking braking system (such as, transmission brakes) such disconnection from the braking surface shall be permitted provided that it is only momentary; for instance, during a change of gear in the use of multi-speed axle and both the service braking and secondary braking systems continue to operate with the prescribed degree of effectiveness. In addition, any such disconnection shall be permitted in the case of the parking braking system provided that is controlled exclusively by the driver from his driving seat by a system which cannot be actuated by a leak.

4.2.1.11 Wear on the brakes shall be easily compensated by means of a system of manual or automatic adjustment. In addition, the control and components of the transmission and of the brakes shall possess a reserve of travel and, where necessary, suitable means of compensations such that, when the brakes become heated or when the brake linings have reached a certain degree of wear, effective braking is ensured without immediate adjustment being necessary.

a) Wear adjustment shall be automatic for the service brakes. However the fitting of automatic adjustment devices shall be optional for off-road vehicles of categories N2 and N3 and for rear brakes of vehicles of categories M1 and N1. Automatic wear adjustment devices shall be such that after heating followed by cooling of brakes, effective braking is still ensured. In particular, the vehicle shall remain capable of normal running after conducting the tests as per **3.3** and **3.4** of IS 11852 (Part 3).

b) It shall be possible to easily check this wear on the service brake linings, from the outside or the underside of the vehicle, utilizing only the tools or equipment normally supplied with the vehicle, for instance, by the provision of appropriate inspection holes or by some other means. Alternatively, acoustical or optical devices warning the driver at his driving position when lining replacement is necessary are acceptable. The removal of front and/or rear wheels is permitted for this purpose on category M1 and N1 vehicles only.

4.2.1.12 In hydraulic braking systems the conditions given below shall be met:

a) The filling ports of the fluid reservoirs shall be readily accessible; in addition, the containers of reserve fluid shall be so made that the level of the reserve fluid can be easily checked without the containers having to be opened. Where this last condition is not fulfilled, a red tell-tale lamp shall warn the driver when the reserve fluid falls to a level liable to cause a failure of the braking system. The tell-tale lamp shall be visible even by day light, the satisfactory functioning of which shall be easily verifiable by the driver.

b) The failure of a part of a hydraulic transmission system shall be signaled to the driver by a device comprising a red tell-tale lamp lighting up immediately on actuation of the control and remaining lit as long as the failure persists and the ignition (start) switch is in the "on" (run) position. However, a system comprising a red tell-tale lamp lighting up when the level of the fluid in its reservoirs falls below the value specified by the manufacturer is permissible. The tell-tale lamp shall be visible even by day light. The lamp shall be such that it enables the driver to verify its satisfactory performance from the driving seat. The failure of a component of the system shall not entail total loss of effectiveness of the braking system in question.

c) The type of fluid to be used in the hydraulic transmission braking systems shall comply with IS 8654. The relevant information indicating the type of fluid used shall be affixed in a visible position in indelible form close to the filling ports of the fluid reservoirs. Additional information, if any, may also be provided by the manufacturers.

4.2.1.13 Any vehicle fitted with a service brake actuated by an energy reservoir shall, where the prescribed secondary braking performance cannot be obtained by means of this brake without the use of stored energy, be provided with a warning device—in addition to a pressure gauge. This warning device shall give an optical and/or acoustic signal when the stored energy in any part of the system falls to a value at which, without recharging of the reservoir and irrespective of the load conditions of the vehicle, it is possible to apply the service brake control for a fifth time after four full brake actuation with closely adjusted brakes and obtain the prescribed secondary braking performance (without faults in the service brake transmission device and with the brakes adjusted as closely as possible). The warning device shall be directly and permanently connected to the circuit. When the engine is running under normal operating conditions and there are no faults in the braking system, the warning system shall give no signal except during the time required for charging the energy reservoir(s) after start-up of the engine.

4.2.1.14 When an auxiliary energy source is essential for the operation of any braking system, the energy reserve shall be such as to ensure that should the engine stop, or failure of energy source, the braking performance remains sufficient to bring the vehicle to a halt in the prescribed conditions. In addition, if the muscular energy supplied by the driver to the parking braking system is reinforced by some aid, the application and release of the parking braking shall be ensured in the event of failure of that aid, if necessary by using a reserve of energy independent of that normally supplying such aid. This reserve of energy may be that intended for the service braking. The expression 'actuation' also covers the action of releasing.

4.2.1.15 In the case of a motor vehicle to which the coupling of a trailer equipped with a brake controlled by the driver of the towing vehicle is authorized, the service braking system of the towing vehicle shall be fitted with a device so designed that if the trailer braking system should fail, or the air supply line (or such other type of connection as may be adopted) between the towing vehicle and trailer should break, it shall still be possible to brake the towing vehicle with the effectiveness prescribed for the secondary braking. It is accordingly prescribed, in particular, that this device be fitted to the towing vehicle.

4.2.1.16 The auxiliary equipment shall draw its energy only in such a way that its operation, even in the event of damage to the energy source, cannot cause the reserves of energy feeding the braking systems to fall below the level indicated in **4.2.1.13**.

4.2.1.17 Where the trailer belongs to category T3 or T4 the service braking system shall be of a continuous or semi-continuous type.

4.2.1.18 In the case of a vehicle authorized to draw a category T3 or T4 trailer, the braking systems shall satisfy the following conditions:

a) When the secondary braking system of the towing vehicle is actuated, there shall also be a graduated braking action on the trailer.

b) Should the service braking system of the towing vehicle fail, and if this device is made up of at least two independent sections, the section or sections not affected by this failure shall be able to partially or fully actuate the trailer brakes. It shall be possible to graduate such braking action. If this operation is achieved by a valve which is normally at rest, then such a valve may only be incorporated if its correct functioning can easily be checked by the driver either from within the cabin or from outside the vehicle, without the use of tools.

c) In the case of a break or leak in one of the air supply lines (or in such other type of connections as may be adopted), it shall be possible for the driver to fully or partially actuate trailer brakes, by means either of the service braking control or of the secondary braking control or of the parking braking control, unless the break or leak automatically causes the trailer to be braked with the performance specified in **4.3.2** of IS 11852(Part 3).

4.2.1.19 In the case of a two-line air supply system, the requirement in **4.2.1.18**(c) above shall be considered to be met if the following conditions are fulfilled:

a) When the designated brake control of the controls mentioned in **4.2.1.18**(c) above is fully actuated, the pressure in the supply line shall fall to 1.5 bar within the following two seconds of its actuation.

b) When the supply line is evacuated at the rate of at least 1 bar/s, the automatic braking of the trailer shall start to operate before the pressure in the supply line falls to 2 bar.

4.2.1.20 The vehicles in category M3 and N4 shall satisfy the type H test (down hill behaviour test) as described in **3.4** of IS 11852 (Part 3).

4.2.1.21 In the case of a pneumatic service braking system comprising two or more independent sections, any leakage between those sections at or downstream of the control shall be continuously vented to atmosphere.

4.2.1.22 Anti-lock braking devices, if fitted on motor vehicle, shall be in accordance with IS 11852 (Part 9).

NOTE — It is recommended that anti-lock braking devices fitted on N3 vehicles authorized to tow category T4 trailers and M3 vehicles shall be of category 1 as specified in IS 11852 (Part 9).

4.2.1.23 In the case of a motor vehicle authorized to tow a trailer of category T3 or T4, the service braking system of the trailer may only be operated in conjunction with the service, secondary or parking braking system of the towing vehicle.

4.2.2 *Vehicles of Category T*

4.2.2.1 Trailers of category T1 need not be fitted with a service braking system. However, if trailers of this category are equipped with a service braking system this shall comply with the same requirements as those of category T2.

4.2.2.2 Every trailer of category T2 shall be fitted with a service braking system either of the continuous or semi-continuous type or of the inertia (over run) type. The latter type shall be authorized only for trailers other than semi-trailers.

4.2.2.3 Every trailer of category T3 or T4 shall be fitted with a service braking system of the continuous or semi-continuous type.

4.2.2.4 The service braking system shall act on all the wheels of the trailer.

4.2.2.5 The action of the service braking system shall be suitably distributed among the axles.

4.2.2.6 The action of every braking system shall be distributed between the wheels of each axle symmetrically in relation to the longitudinal median plane of the vehicle.

4.2.2.7 The braking surfaces required to attain the prescribed degree of effectiveness shall be in constant contact with the wheels, either rigidly or through components not liable to failure.

4.2.2.8 Wear on the brake shall be easily compensated by a system of manual or automatic adjustment. In addition, the control and the components of the transmission and of the brakes shall possess a reserve of travel and, if necessary, suitable means of compensation such that, when the brakes become heated or when the brake linings have reached a certain degree of wear, effective braking is ensured without immediate adjustment being necessary.

4.2.2.8.1 Wear adjustment shall be automatic for service brakes. However, the fitting of automatic adjustment device shall be optional for off-road vehicles of Categories T1 and T2. Automatic wear adjustment systems, if provided, shall be such that after heating followed by cooling of the brakes, effective braking is still ensured. In particular, it shall remain capable of normal running after the tests conducted in accordance with 3.3 (Type F test) and 3.4 (Type H test) of IS 11852 (Part 3).

4.2.2.8.2 It shall be possible to easily check this wear on service brake linings, from the outside or underside of the vehicle, utilizing only the tools or equipment normally supplied with the vehicle; for instance, by the provision of appropriate inspection holes or by some other means.

4.2.2.9 The braking systems shall be such that the trailer is stopped automatically if the coupling separates while the trailer is in motion. However, this requirement shall not apply to trailers with a maximum weight not exceeding 1.5 t provided that the trailers are fitted, in addition to the main coupling, with a secondary coupling (chain, cable, etc) which, in the event of separation of the main coupling, can stop the drabber from touching the ground and provide some residual steering action on the trailer.

4.2.2.10 On trailers of T2, T3, T4 categories which are required to be fitted with a service braking system, parking braking shall be ensured even when the trailer is separated from the towing vehicle. It shall be possible for a person standing on the ground to actuate the parking braking system. However, in the case of a trailer used for the carriage of passengers, it shall be possible to actuate this brake from inside the trailer. The expression 'actuate' also covers the action of releasing.

4.2.2.11 If the trailer is fitted with a system enabling compressed air actuation of the braking system, other than the parking braking system, to be cut out, the first-mentioned device shall be so designed and constructed that it is positively restored to the 'at rest' position immediately on the resumption of the supply of compressed air to the trailer.

4.2.2.12 Trailers of categories T3 and T4 fitted with a two-line air supply system shall satisfy the conditions specified in **4.2.1.18**(c) above.

4.2.2.13 Trailers of category T4 shall be fitted with anti-lock braking devices in accordance with IS 11852 (Part 9).

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Automotive Braking System Sectional Committee, TED 4

Chairman	*Representing*
Shri R. C. Sethi	VRDE, Ahmednagar
Members	
Shri N. Kuruppaiah Shri K. Senthil Kumar (*Alternates* to Shri R.C. Sethi)	
Shri Vijay Kumar Shri Rajesh Goyal (*Alternate*)	Allied Nippon Ltd, New Delhi
Shri R. R. G. Menon	Ashok Leyland Ltd, Chennai
Shri B. Ghosh Shri M. S. Ogale (*Alternate*)	Automotive Research Association of India, Pune
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